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NOTES ON *MEGATHYMUS URSUS*, WITH DESCRIPTION OF A RELATED NEW SPECIES (MEGATHYMIDÆ)

by DON B. STALLINGS and J. R. TURNER

Megathymus ursus has intrigued us ever since we became interested in the genus *Megathymus*. There were probably two reasons: 1) its huge size and 2) its extreme rarity in collections. This species was described by POLING in 1902 from a single female specimen (*Ent. News*, vol 13: p. 97, pl. 4). The original description reports the type caught in Pinal County, Arizona. No date for capture is given. It is interesting to note that while POLING described this as a new species he did not actually think that it was. He considered it the female of *M. neumoegeni.*

Sometime in the early 1940s we started making inquiries about this species. We learned that at that time there were only three specimens known, all females and all in the Barnes Collection in the United States National Museum. The two specimens other than the type had the following data: Redington, Ariz., no date, and Santa Catalina Mts., Ariz., Pinal County, Aug. 16 — 23.

Our first impression of *M. ursus* after viewing the colored plates of Poling and Holland was that it was an overgrown *M. yuccæ* Bdv. & Lec. In as much as the *Yucca* feeders of this genus usually fly in the spring or early summer (whereas the *Agave* feeders usually fly in the late summer or fall), we decided that the normal period of flight should be in the late spring or early summer. Following this idea DON B. and VIOLA STALLINGS and sons, DEE and JACK, went into southeast Arizona in June of 1946 to hunt for *M. ursus;* that they did not find any was no great surprise.

The next few years we did no active hunting for this species but did correspond with a great many collectors trying to get ideas as to when and where to look for it. We discussed the situation for hours with our friend, H. A. FREEMAN, who was just as interested in the subject as we were, and we have often wondered if our friend LLOYD M. MARTIN, of the Los Angeles County Museum, ever got tired of answering the many letters we wrote him on the subject.

We discarded the idea of it being a *Yucca* feeder and turned to the *Agave* plants. One species, *A. palmeri* Engelmann, because of its huge size, was a prime

favorite as a possible food plant. This was not a new idea on our part, for most of the collectors who had hunted for *M. ursus* felt that *A. palmeri* was the plant.

Our interest was renewed in 1949 when MARTIN advised us that R. H. REID had captured a female in Madera Canyon in the Santa Rita Mts. of Arizona on Aug. 15th. In the fall of 1951 Dr. and Mrs. R. C. TURNER decided to do some looking for this species. They returned home without any specimens, but with the report that while in the Museum of the Chiricahua National Monument in the Chiricahua Mts. of Arizona they saw a female specimen that had been caught in the Monument. The specimen had no date on it. They also brought back with them a huge bloom stalk of *A. palmeri* with a hole in it that had all the indications of being the work of a larva of *Megathymus*. We were sure that this was the answer to our problem and that it was merely a matter of going back and collecting the larvæ. We assumed that the larvæ left the egg and went into the bloom stalk as it was growing. The following spring found Dr. and Mrs. TURNER in Arizona again, but of course the bloom stalks had not commenced to grow. They returned home empty handed.

On Aug. 24th, 1952, ROBERT J. FORD caught a female specimen in Madera Canyon. DON B. and VIOLA STALLINGS immediately left for Arizona. After considerable hunting they were able to find a bloom stalk with an occupant. It turned out to be a wild bee. Then they made a plant survey of all the possible areas where M. *ursus* had been found or might be expected. There was one potential food plant that was conspicious: *Yucca schottii* Engelmann. During 1953 as we considered the problem further and discussed it with FREEMAN, we became convinced that *M. ursus* was a *Yucca* feeder and that *Y. schottii* was the food plant. That fall MARTIN advised us that another female had been caught in Madera Canyon on Aug. 10th. There were now 7 known specimens, all females, and four with dates of capture.

In August of 1954 Dr. & Mrs. R. C. TURNER and DON B., VIOLA, DEE, and JACK STALLINGS returned to Arizona in further search of *M. ursus*. Three days before they arrived in the Chiricahua Mts. there had been heavy rains which had done considerable eroding. On the morning of Aug. 18th at 10.30 A.M., while we were driving down Pinery Canyon in the Chiricahua Mts. at an elevation of 6200 feet, a female *M. ursus* was spotted flying around several juvenile plants of *Yucca schottii* presumably trying to decide on which plant to deposit an egg. The plants were on the side of the mountain with a ten foot bank above the road. JACK STALLINGS was the first who was able to scale the bank with net in hand and he carefully swept the female into his net. As he flipped the net to complete the capture it caught on a thorn bush and an 18 inch hole was ripped in the net. The *M. ursus* was gone in a flash. Like ALEXANDER he sat down and cried; — his father wanted to. No other specimens were observed on this trip. Careful search of the *Y. schottii* plants failed to turn up any larvæ or pupæ. Seven old "tents" were found in young plants, and in one the pupal case was still in good condition. There could be no doubt now as to the food plant of *M. ursus*.

In March of 1955 Dr. and Mrs. TURNER returned to the Chiricahua Mts. in a further search for larvæ. In three days hard searching they found 8 larvæ. On three of the plants with larvæ the egg shell was still attached to the leaf. The eggs

do not appear greatly different from the eggs of other *Megathymus* that feed on *Yucca.* The largest egg measured 4.25 mm., the average diameter was 4.0 mm. The female nearly always selects a tiny plant on which to lay an egg. It may be a new plant or a new shoot off of an old plant; it usually does not have over 15 leaves. The plant is small enough so that normally the larva kills the plant or shoot, the leaves then flatten out on the ground, and tree leaves blow over the plant making it next to impossible to find the "tent". All larva-bearing *Yucca* were found in timber, usually on the side of a canyon or mountain. The larvæ, still in their food plant, were brought back to Caldwell. On June 25th three of the larvæ were checked. All three had hymenopterous parasites (Eucoilidæ). On July 7th the other five larvæ were checked. Four of them had parasites; the last had an empty pupal case, still damp. Thereupon there was a frantic search of the basement area where these five larvæ had been kept. Finally Mrs. STALLINGS found the remains: it was male; the abdomen was gone, one antenna remained, three wings were half gone, the fourth was in good condition. The conversation that ensued will not be repeated here.

On July 17th the clan was gathered and fifteen of us left for the Chiricahua Mts. Seven of us were in the field for four days, despite the constant rain. The first day we found three "tents", all with larvæ in about the third instar. This upset our thinking on what we should be finding until we realized that these were not *M. ursus* larvæ, but were larvæ of a species of the *M. yuccæ* complex which normally feeds on *Yucca confinis* McKelvey (our identification) but will on occasion lay eggs on *Y. schottii.* The second day one pupa was found, and on the third day two pupæ were found. The fourth and last day yielded nothing. The first pupa hatched July 30th and was a male; the other two hatched August 6th and were females. So far as we know these two males are the only males known. We will not go into any lengthy description, as the plates picture the male and female. It will be noted that the antenna of both sexes is white. The yellow wing-spots in both sexes have a bit more buff or orange color than we had expected from the previous specimens we had examined. We designate the July 30th male specimen, pictured herein, as the ALLOTYPE of *M. ursus.*

We have more than 2000 specimens of *Megathymus,* three-fourths of which were reared from collected larvæ or pupæ. We have always been able to get a newly hatched specimen to crawl up on our finger and remain there for several minutes motionless, except with *M. ursus.* Once touched they seem to go crazy and begin to beat themselves to pieces. The party collecting the three pupæ included Dr. and Mrs. R. C. TURNER, Dr. and Mrs. J. R. TURNER, JUDITH, GAYLE and J. R. JR., Mr. and Mrs. DON B. STALLINGS, DEE and JACK, R. L. TURNER JR., MARY LEE TURNER, Mr. and Mrs. W. O. RAYPHOLTZ.

In August of 1953 Dr. and Mrs. R. C. TURNER, Dr. and Mrs. J. R. TURNER, JUDITH and GAYLE discovered some old tents in *Yucca torreyi* Shafer while doing some research in Carlsbad Caverns National Park in New Mexico. In March of 1954 Dr. and Mrs. R. C. TURNER returned to the area and collected 7 larvæ. The larvæ did not look unlike larvæ of members of the *M. yuccæ* complex, but they continued to feed up to the first of May, whereas the larvæ of the *M. yuccæ* complex do little or no feeding after overwintering. Three of these

larvæ pupated and hatched. In March of 1955 Dr. and Mrs. R. C. TURNER collected 4 larvæ in the area as they were returning from the Chiricahua Mts. with the 8 *M. ursus* larvæ. The *M. ursus* larvæ were a full instar behind the Carlsbad larvæ. In May 1955 more larvæ were collected by Dr. J. R. TURNER, Mrs. R. C. TURNER, JACK and Mr. and Mrs. DON B. STALLINGS, and KENT WILSON, including 9 larvæ in *Yucca baccata* Torrey. When the first specimen emerged in 1954 it was evident that we had something new and in our opinion the most beautiful of all the *Megathymus* now known. It is described as follows:

Megathymus violæ STALLINGS & TURNER, new species

FEMALE. Upper surface of primaries: deep black with a small amount of white hairs at the base of the wing and a larger amount of white scales on the tip that gives the base and tip a gray appearance. Spot 1 (cell spot) is bright orange. Spots 2, 3, and 4 (subapical spots) are elongated, the bottom two being bright orange in color and the top one white, with a white spot located inward from it. Spot 5 and 6 (submarginal spots) are bright orange and rather long. The discal band, composed of spots 7, 8, and 9, is bright orange. These spots are also elongated, being 8 mm. to 10 mm. long. The fringes are smoky with vein-tips black. Spots 5, 6, 7, 8, and 9 are in alignment on the outer edge.

Under surface of primaries: black with the tip and outer margin overscaled with white, giving that area a gray appearance. All dorsal spots reappear. Spots 1, 5, 6, 7, 8, and 9 are light orange. Spots 2, 3, and 4 are white. Spot 9 (bottom spot) extends inwardly (narrowly) almost to the base.

Upper surface of secondaries: deep black with a small amount of white hairs at the base that creates a gray appearance in this area. There is a small, faint orange spot between veins Cu_1 and M_3. The fringes are white with vein tips black.

Under surface of secondaries: black overscaled with white, giving a gray appearance. The veins do not carry the white overscaling, thus giving a very contrasting appearance. The costal area is heavily overscaled with white and has two white spots in it. There is a small white spot between veins A_1 and Cu_2 in the anal area.

Abdomen: black. Thorax: gray above, blackish below. Palpi: light gray. Antennæ: white. Head: black around the eyes and gray around the antennæ.

Length of forewing from 35 mm. to 40 mm.; average 37 mm. Wing measurements of the Holotype: forewing, apex to base 39 mm., apex to outer angle 25 mm., outer angle to base 24 mm.; hindwing, base to end of vein Cu_1 28 mm.

MALE. Upper surface of primaries: deep black with the same general overscaling as in the female, except in a smaller degree. The spots are the same as in the female, only smaller; however, spots 2 and 3 are white instead of bright orange. The fringes are checkered gray and black.

Upper surface of secondaries: deep black with a few white hairs at the base. The fringes are white with vein-tips black.

Under surface of primaries: as in the female, except that spot 9 does not extend inwardly as much as in the female.

Under surface of secondaries: as in the female, except that the white overscaling is more dense.

Abdomen, thorax, palpi, antennæ, and head as in the female.

Length of forewing from 26 mm. to 31 mm., average 30 mm. Wing measurements of Allotype: forewing, apex to base 31 mm., apex to outer angle 20 mm., outer angle to base 20 mm.; hindwing, base to end of vein Cu_1 21 mm.

The genitalia of both sexes are small compared to other species of *Megathymus*. The male genitalia of *M. violæ* do not appear to be as dense as *M. ursus*. The apical portion of the valva of the male *M. violae* is less than 0.4 times as wide as the widest point in

middle of the valva, while the apical portion of the valva of the male *M. ursus* is about 0.6 times as wide as the widest point in middle of valva. In *M. ursus* the uncus seen in lateral view tapers evenly, whereas in *M. violæ* it has a pre-apical enlargement before abruptly tapering to a point. In the female of *M. ursus* the genital plate has a strong lateral spur on each side, while in *M. violæ* this spur is much weaker. (See figures.)

Described from 21 specimens (7 males and 14 females), all ex-larvæ. Specimens collected in the Carlsbad Caverns National Park in the Guadeloupe Mts., New Mexico. Food plant: *Yucca torreyi* Shafer. Not included in the type series are two females and three males, ex-larvæ, that used *Yucca baccata* as a food plant. We have not been able to find characters to distinguish the *Y. baccata* feeders from the *Y. torreyi* feeders.

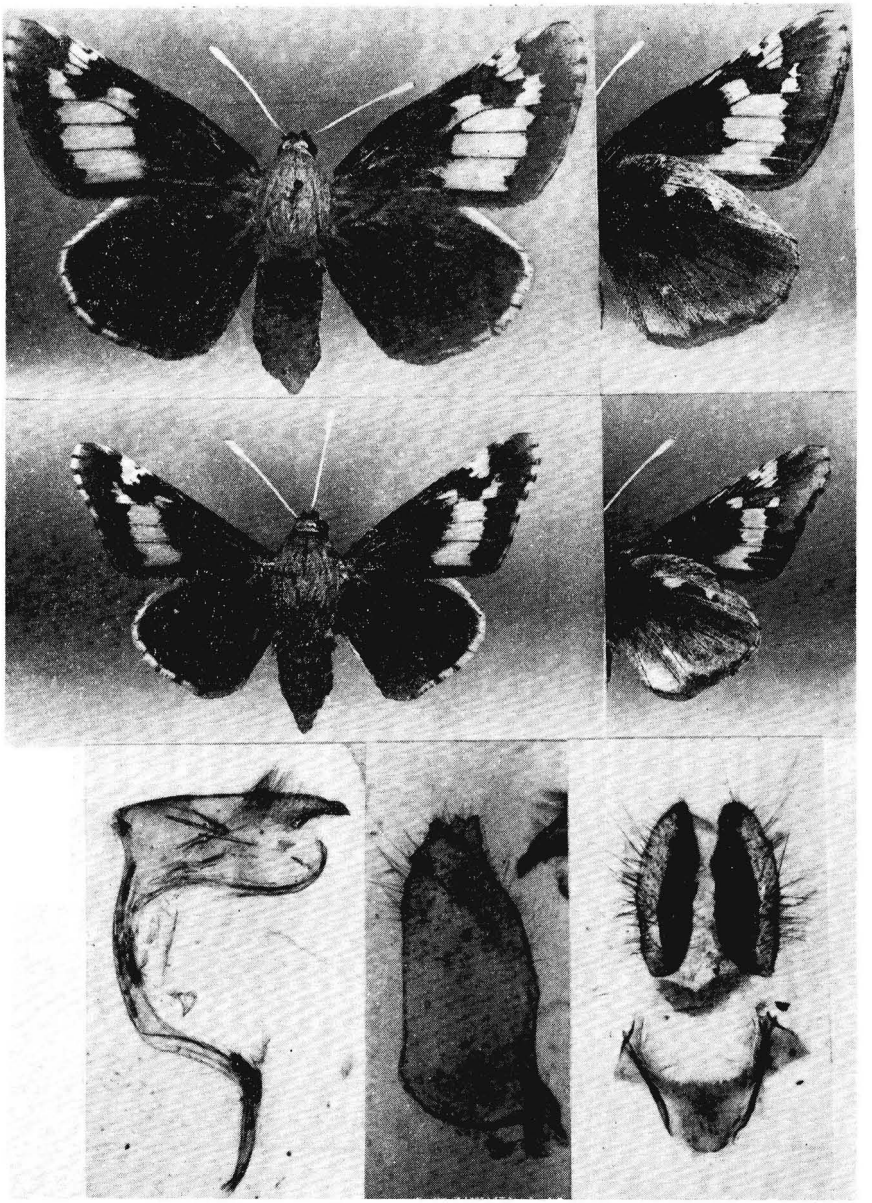
HOLOTYPE, female, June 29, 1955 (STALLINGS & TURNER); ALLOTYPE, male, June 26, 1955 (STALLINGS & TURNER), both from Carlsbad Caverns National Park, New Mexico, are in the collection of the authors. One male and one female paratype is being deposited in each of the following collections: U. S. National Museum, American Museum of Natural History, Los Angeles County Museum, H. A. FREEMAN, KENT WILSON, Dr. C. L. REMINGTON.

We have seen fit to make the female the HOLOTYPE, particularly in view of the fact that *M. ursus* was described from a single female. We are seriously considering using females for Holotypes in future papers on this genus, because the female seems to present the distinguishing characters better. Nearly every entomologist with whom we have discussed this question agrees that it would probably be best to use the female.

M. violæ has two major characters by which it may easily be distinguished from *M. ursus:* 1) the wing spots are bright orange, almost red, in color; in *M. ursus* these are brassy yellow; 2) these spots are larger, particularly spot 9, which is as large as or larger than spots 8 and 7; in *M. ursus* spot 9 is somewhat smaller than 8 or 7. The food plants and habits are also quite different. *M. ursus* appears to prefer timbered areas, and the females at least, in searching for plants on which to deposit eggs, must fly under and through the timber and usually select plants on the side of mountains or canyons. *M. violæ* nearly always selects plants on level terrain for oviposition. We found all of the larvæ either on top of the mesa-like mountains or at the bottom of canyons. We doubt that the female normally flies above the brush line, for all larvæ were found in open areas. A number of small areas were open and had ideal plants but were completely surrounded by brush; never did we find a "tent" in such an area. And while *M. violæ* selects a small plant on which to lay her egg, it selects larger plants than does *M. ursus,* for the larva seldom kills the plant and in several instances we found two "tents" in a single plant, each larva with its burrow separate from that of its companion.

We doubt that *Y. baccata* is a regular food plant of *M. violæ,* for of the 9 larvæ collected all hatched, but 4 were unable to expand the wings. On the other hand, of the *Y. torreyi* feeders only two that hatched failed to expand.

M. violæ plays host to parasites both of the Tachinidæ (Larvævoridæ) and the Eucoilidæ, but thus far we have found *M. ursus* parasitized only by Eucoilidæ.

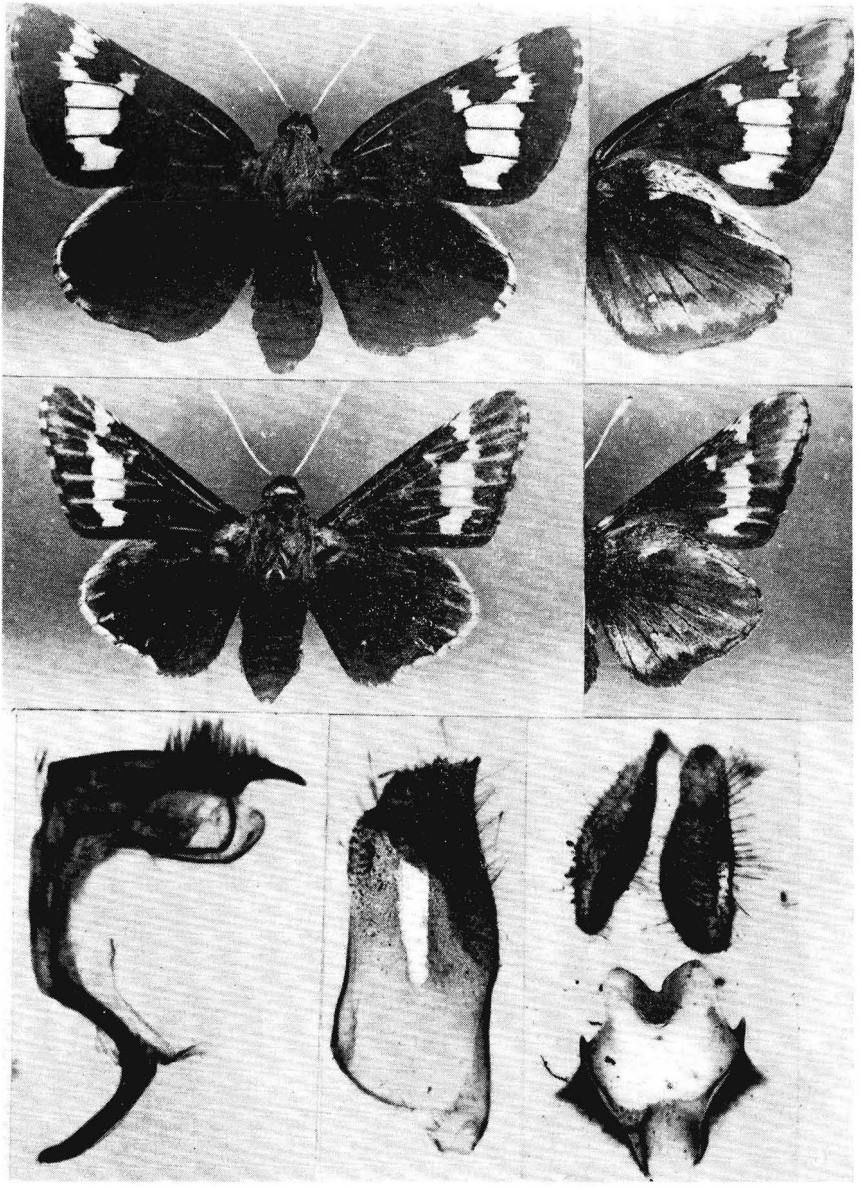


Top row: *M. violæ* HOLOTYPE ♀, Carlsbad Nat. Park, N. Mex., 29 June 1955 (S. & T. Coll.).

2nd row: *M. violæ* ALLOTYPE ♂, Carlsbad Nat. Park, N. Mex., 26 June 1955 (S. & T Coll.).

[Uppersides at left; undersides at right]

Lower row: *M. violæ* genitalia, left to right: ♂ uncus and ♂ valva, Carlsbad Nat. Park, N. Mex., 31 May 1954 (No. 115, S. & T. Coll.), ♀ genital plate, Carlsbad Nat. Park, N. Mex., 27 May 1954 (No. 116, S. & T. Coll.).



Top row: *M. ursus* ♀, Chiricahua Mts., Ariz., 6 Aug. 1955 (Specimen No. 136, S. & T. Coll.).

2nd row: *M. ursus* ♂, Chiricahua Mts., Ariz., 30 July 1955 (No. 130, S. & T. Coll.). [Uppersides at left; undersides at right]

Lower row: *M. ursus* genitalia, left to right: ♂ uncus and ♂ valva (No. 130, S. & T. Coll.); ♀ genital plate, Madera Canyon, Ariz., 15 Aug. 1949, R. H. REID Coll. (No. 118).

Contrary to previous reports, *M. ursus* does have spines on the claw segment of the hind tibiæ; however, they are few and small. *M. violæ* has a good number of well developed spines in this area, twice as long as those of *M. ursus*.

The *M. ursus-violæ* complex can be distinguished from other species groups of the genus by the white antennæ and the gray overscaling on the undersides of the secondaries, in which the veins do not carry the overscaling, thus creating a very contrasting appearance.

M. violæ is named for the wife and sister of the authors, who has played a major part in the work on the genus *Megathymus*.

These two species seem to be combination sap feeders and pulp feeders; the burrow they make in the plant as larvæ is usually not over six inches deep and they do not powder the burrow with the usual white powder of *Megathymus* until a few days before they pupate, whereas the members of the *M. yuccæ* complex will often powder the upper portion of their burrow many weeks before they pupate. The burrow of other known *Yucca* feeding *Megathymus* is much deeper, and these appear to feed on pulp. The *Agave* feeders make little or no burrow beyond a space fitting the larval body, and these are presumed to feed on sap.

Our limited experience with *M violæ* and *M. ursus* indicates that their period of flight varies from year to year. The determining factor is probably the type of winter. If the winter is open and mild they probably fly early, and if the winter is severe or late they fly late. Our Carlsbad material in 1954 hatched from May 27th to June 4th, but in 1955 (which had a late freeze) the hatching period was from June 20th to July 8th. Normally we may expect *M. ursus* to fly during the month of August and *M. violæ* to fly during the month of June.

Some statistical information may be of interest. The average actual field time consumed per *M. ursus* collected was 77½ man hours (this was for the field work in 1955, when we knew what to look for and where to look), and for *M. violæ* it was 7¼ man hours per specimen.

It is our guess that *M. violæ* is now at the peak of a population increase, while *M. ursus* is at the bottom of a decline. This might explain in part why *M. violæ* is now, in some instances, using *Y. baccata* as a food plant. It will be interesting to discover whether *M. ursus* ever uses any of the *Y. baccata* complex (*Yucca confinis* McKelvey, *Yucca thornberi* McKelvey, *Yucca arizonica* McKelvey) as a food plant.

We wish to thank the National Park Service for their cooperation in our research on these butterflies and particularly the personnel of Carlsbad Caverns National Park and Chiricahua National Monument. Our thanks also go to WILLIAM D. FIELD of the U.S.N.M. for photographs of the Barnes specimens; LLOYD M. MARTIN, R. H. REID and ROBERT J. FORD for the loan of specimens for dissection; H. A. FREEMAN and Drs. C. L. REMINGTON and C. D. MICHENER for their advice and help in the preparation of this paper.

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